

**Excerpts from 180 NAC 1 for Veterinary Facilities**

EFFECTIVE DATE      NEBRASKA HEALTH AND HUMAN SERVICES  
APRIL 12, 2003      REGULATION AND LICENSURE      180 NAC 1

TITLE 180      CONTROL OF RADIATION

CHAPTER 1      GENERAL PROVISIONS

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**ATTACHMENTS**

Copies of the Code of Federal Regulations (CFR) cited in this Chapter are available for inspection at the Department of Health and Human Services Regulation and Licensure, 301 Centennial Mall South, 3<sup>rd</sup> Floor, Lincoln, Nebraska.

10 CFR 1 through 199 (January 1, 2002)

40 CFR 100 through 135 and 190 through 265 (July 1, 2002)

49 CFR 100 through 399 (October 1, 2001)

Or at <http://www.access.gpo.gov/nara/cfr/index.html>

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TITLE 180      CONTROL OF RADIATION

CHAPTER 1      GENERAL PROVISIONS

1-001 SCOPE AND AUTHORITY:

1-001.01      Except as otherwise specifically provided, Title 180 applies to all persons who receive, possess, use, transfer, own, or acquire: (1) any radiation generating equipment; (2) any naturally occurring or accelerator produced radioactive material; and (3) any radioactive: (a) source material; (b) byproduct material; and, (c) special nuclear material; in quantities not sufficient to form a critical mass. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Rev. Stat. §§ 71-3501 - 71-3519.

1-001.02      10 Code of Federal Regulations (CFR), as published on January 1, 2002; 40 CFR as published on July 1, 2002 and 49 CFR as published on October 1, 2001 and referred throughout this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services Regulation and Licensure, Public Health Assurance Division, 301 Centennial Mall South, 3<sup>rd</sup> Floor, Lincoln, Nebraska 68509.

1-002 DEFINITIONS:      As used in Title 180 , these terms have the definitions set forth below. Additional definitions used only in certain Title 180 Chapters will be found in that Chapter.

Absorbed dose means the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the gray (Gy) and the rad.

Act means Radiation Control Act. §§ 71-3501 to 71-3519, Reissue Revised Statutes of Nebraska, 1943. As amended.

Adult means an individual 18 or more years of age.

Agency means the Department of Health and Human Services Regulation and Licensure.

As low as is reasonably achievable (ALARA) means making every reasonable effort to maintain exposures to radiation as far below the dose limits in these regulations as is practical, consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed or registered sources of radiation in the public interest.

Background radiation means radiation from cosmic sources; naturally occurring radioactive materials, including radon, except as a decay product of source or special nuclear material, and including global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation and are not under the control of the licensee. Background radiation does not include sources of radiation from radioactive materials regulated by the Agency.

Calendar quarter means not less than 12 consecutive weeks nor more than 14 consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be so arranged such that no day is included in more than one calendar quarter and no day in any one year is omitted from inclusion within a calendar quarter. No licensee or registrant shall change their method for determining calendar quarters except at the beginning of a year.

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Calibration means the determination of (1) the response or reading of an instrument relative to a series of known radiation values over the range of the instrument, or (2) the strength of a source of radiation relative to a standard.

CFR means Code of Federal Regulations.

Civil penalty means any monetary penalty levied on a licensee or registrant because of violations of statutes, rules, regulations, licenses, or registration certificates, but does not include criminal penalties.

Collective dose means the sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation.

Deep dose equivalent (DDE) ( $H_d$ ), which applies to external whole body exposure, means the dose equivalent at a tissue depth of 1 centimeter (1000 mg/cm<sup>2</sup>).

Director means Director of Regulation and Licensure.

Dose is a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, total organ dose equivalent, or total effective dose equivalent. For purposes of 180 NAC, radiation dose is an equivalent term.

Dose equivalent ( $H_t$ ) means the product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the sievert (Sv) and rem.

Dose limits means the permissible upper bounds of radiation doses established in accordance with these regulations. For purposes of these regulations, limits is an equivalent term.

Effective dose equivalent (EDE) ( $H_E$ ) means the sum of the products of the dose equivalent to each organ or tissue ( $H_T$ ) and the weighting factor ( $w_T$ ) applicable to each of the body organs or tissues that are irradiated ( $H_E = \sum w_T H_T$ ).

Electronic product means any manufactured product, device, assembly, or assemblies of such products or devices which, during operation in an electronic circuit, can generate or emit a physical field of radiation.

Embryo/fetus means the developing human organism from conception until the time of birth.

E (Exponent) indicates that the number 10 is to be raised to a given power. This power is indicated to the right of the symbol E. For example: 3E+4 symbolizes  $3 \times 10^4$  and 3E-4 symbolizes  $3 \times 10^{-4}$ .

Exposure means being exposed to ionizing radiation or to radioactive material.

Exposure<sup>1</sup> means the quotient of dQ by dm where "dQ" is the absolute value of the total charge of the ions of one sign produced in air when all the electrons (negatrons and positrons) liberated by photons in a volume element of air having mass "dm" are completely stopped in air. The SI unit of exposure is the coulomb per kilogram (C/kg). See 180 NAC 1-015.01 Units of Exposure and Dose for the special unit .

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<sup>1</sup>When not underlined as above [or indicated as "exposure" (X)] the term "exposure" has a more general meaning in Title 180.

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Exposure rate means the exposure per unit of time, such as roentgen per minute (R/min) or milliroentgen per hour (mR/h).

External dose means that portion of the dose equivalent received from any source of radiation outside the body.

Extremity means hand, elbow, arm below the elbow, foot, knee, and leg below the knee.

Gray (Gy) means the SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (100 rad).

Healing arts means diagnostic and/or healing treatment of human and animal maladies including but not limited to the following which are duly licensed by the State of Nebraska for the lawful practice of: medicine and its associated specialties, dentistry, veterinary medicine, osteopathy, chiropractic, and podiatry.

Human use means the internal or external administration of radiation or radioactive material to human beings.

Individual means any human being.

Individual monitoring means the assessment of:

1. Dose equivalent (a) by the use of individual monitoring devices or (b) by the use of survey data; or
2. Committed effective dose equivalent (a) by bioassay or (b) by determination of the time-weighted air concentrations to which an individual has been exposed, that is, DAC-hours. [See the definition of DAC-hours in 180 NAC 4].

Individual monitoring devices (individual monitoring equipment) means devices designed to be worn by a single individual for the assessment of dose equivalent such as film badges, termoluminescence dosimeters (TLD's), pocket ionization chambers, and personal ("lapel") air sampling devices. For the purposes of these regulations, personnel dosimeter and dosimeter are equivalent terms.

Inspection means an official examination or observation including, but not limited to, tests, surveys, and monitoring to determine compliance with rules, regulations, orders, requirements, and conditions of the Agency. The licensee or registrant is notified of any items of noncompliance and/or recommendation of the Agency.

Licensed practitioner means a person licensed to practice medicine, dentistry, podiatry, chiropractic, osteopathic medicine and surgery, or as an osteopathic physician.

Limits [See Dose limits]

Member of the public means any individual except when that individual is receiving an occupational dose.

Minor means an individual less than 18 years of age.

Monitoring means the measurement of radiation, radioactive material concentrations, surface area activities or quantities of radioactive material and the use of the results of these measurements to

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evaluate potential exposures and doses. For the purposes of Title 180 radiation monitoring and radiation protection monitoring are equivalent terms.

Occupational dose means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to sources of radiation from licensed or unlicensed sources of radiation, whether in the possession of the licensee, registrant, or other person. Occupational dose does not include doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with 180 NAC 7-030, from voluntary participation in medical research programs, or as a member of the public.

Person means any individual, corporation, partnership, limited liability company, firm, association, trust, estate, public or private institution, group, agency, political subdivision of this State, any other State or political subdivision or agency thereof, and any legal successor, representative, agent, or agency of the foregoing.

Personnel dosimeter: [See Individual monitoring devices].

Personnel monitoring equipment [See Individual monitoring devices].

Public dose means the dose received by a member of the public from exposure to sources of radiation released by a licensee or registrant, or to any other source of radiation under the control of a licensee or registrant. Public dose does not include occupational dose or doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with 180 NAC 7-030, or from voluntary participation in medical research programs.

Quality factor (Q) means the modifying factor, listed in Tables I and II of 180 NAC 1-015, that is used to derive dose equivalent from absorbed dose.

Rad means the special unit of absorbed dose. One rad is equal to an absorbed dose of 100 erg per gram or 0.01 joule per kilogram (0.01 gray).

Radiation means ionizing and nonionizing radiation as follows: (a) Ionizing radiation means gamma rays, x-rays, alpha and beta particles, high-speed electrons, neutrons, protons, and other atomic or nuclear particles or rays, but does not include sound or radiowaves or visible, infrared, or ultraviolet light; and (b) nonionizing radiation means (i) any electromagnetic radiation which can be generated during the operations of electronic products to such energy density levels as to present a biological hazard to occupational and public health and safety and the environment, other than ionizing electromagnetic radiation, and (ii) any sonic, ultrasonic, or infrasonic waves which are emitted from an electronic product as a result of the operation of an electronic circuit in such product and to such energy density levels as to present a biological hazard to occupational and public health and safety, and the environment.

Radiation area means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.05 mSv (0.005 rem) in 1 hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

Radiation Dose [See "Dose"]

Radiation generating equipment means any manufactured product or device, component part of such a product or device, or machine or system which during operation can generate or emit radiation except devices which emit radiation only from radioactive material.

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Radiation safety officer means an individual who has the knowledge and responsibility to apply appropriate radiation protection regulations.

Registrant means any person who is registered with the Agency and is legally obligated to register with the Agency pursuant to Title 180 and the Act.

Registration means registration with the Agency pursuant to the Act and in accordance with the regulations adopted by the Agency.

Regulations of the U.S. Department of Transportation means the regulations in 49 CFR Parts 100-189.

Rem means the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor (1 rem = 0.01 Sv).

Restricted area means an area, access to which is limited by the licensee or registrant for the purpose of protecting individuals against undue risks from exposure to sources of radiation. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.

Roentgen means the special unit of exposure. One roentgen (R) equals 2.58E-4 coulombs per kilogram of air (see "Exposure" and 180 NAC 1-015).

SI means the abbreviation for the International System of Units.

Sievert means the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sievert is equal to the absorbed dose in gray multiplied by the quality factor (1 Sv = 100 rem).

Sources of radiation means any radioactive material, any radiation-generating equipment or any device or equipment emitting or capable of emitting radiation or radioactive material.

Survey means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of sources of radiation. When appropriate, such evaluation includes, but is not limited to, tests, physical examinations, and measurements of levels of radiation or concentrations of radioactive material present.

Test means the process of verifying compliance with an applicable regulation.

These regulations mean all Chapters of Title 180 "Control of Radiation".

Total effective dose equivalent (TEDE) means the sum of the deep-dose equivalent for external exposures and the committed effective dose equivalent for internal exposures.

Unrestricted area means an area, access to which is neither limited nor controlled by the licensee or registrant. For purposes of these regulations, uncontrolled area is an equivalent term.

Violation means an infringement of any rule, license or registration condition, order of the Agency, or any provision of the Act.

Week means 7 consecutive days starting on Sunday.

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Whole body means, for purposes of external exposure, head, trunk including male gonads, arms above the elbow, or legs above the knee.

Worker means an individual engaged in work under a license or registration issued by the Agency and controlled by a licensee or registrant, but does not include the licensee or registrant.

Year means the period of time beginning in January used to determine compliance with the provisions of Title 180. The licensee or registrant may change the starting date of the year used to determine compliance by the licensee or registrant provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years.

### **1-003 EXEMPTIONS**

1-003.01 General Provision: The Agency may, upon application or upon its own initiative, grant such exemptions or exceptions from the requirements of Chapter of NAC 180 as it determines are authorized by law and will not result in undue hazard to public health and safety or property.

1-004 RECORDS: Each licensee and registrant must maintain records showing the receipt, transfer, and disposal of all sources of radiation. Additional record requirements are specified elsewhere in Title 180.

### **1-005 INSPECTIONS**

1-005.01 Each licensee and registrant must afford the Agency at all reasonable times opportunity to inspect sources of radiation and the premises and facilities wherein such sources of radiation are used or stored.

1-005.02 Each licensee and registrant must make available to the Agency for inspection, upon reasonable notice, records maintained pursuant to Title 180.

1-006 TESTS: Each licensee and registrant must perform upon instructions from the Agency, or must permit the Agency to perform, such reasonable tests as the Agency deems appropriate or necessary including, but not limited to, tests of:

1. Sources of radiation;
2. Facilities wherein sources of radiation are used or stored;
3. Radiation detection and monitoring instruments; and
4. Other equipment and devices used in connection with utilization or storage of licensed or registered sources of radiation.

1-007 ADDITIONAL REQUIREMENTS: The Agency may, by rule, regulation, or order, impose upon any licensee or registrant such requirements in addition to those established in these regulations as it deems appropriate or necessary to minimize danger to public health and safety or property.

1-008 VIOLATIONS: An injunction or other court order may be obtained prohibiting any violation of any provision of the Act. Any person who violates any provision of the Act may be guilty of a Class IV misdemeanor and, upon conviction, may be punished as determined by the court. (See 180 NAC 17.)

1-009 IMPOUNDING: Sources of radiation are subject to impounding pursuant to § 71-3516 of the Act.



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### **1-010 PROHIBITED USES**

1. A hand-held fluoroscopic screen must not be used with x-ray equipment unless it has been listed in the Registry of Sealed Source and Devices or accepted for certification by the U.S. Food and Drug Administration, Center for Devices and Radiological Health.
2. A shoe-fitting fluoroscopic device must not be used.

### **TESTING FOR LEAKAGE OR CONTAMINATION OF SEALED SOURCES**

**1-012 COMMUNICATIONS:** All communications and reports concerning Title 180, and applications filed thereunder, should be addressed to the Agency at its office located at

Department of Health and Human Services Regulation and Licensure  
Public Health Assurance Division  
301 Centennial Mall South  
P.O. Box 95007  
Lincoln, Nebraska 68509-5007

**1-014 DISCRIMINATION PROHIBITED:** The Agency must not exclude any person on the ground of sex from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity licensed by this Agency. This provision will be enforced through provisions established, with respect to racial and other discrimination, under the Nebraska Fair Employment Act. This remedy is not exclusive, however, and will not prejudice or cut off any other legal remedies available to a discriminatee.

### **1-015 UNITS OF EXPOSURE AND DOSE**

**1-015.01** As used in Title 180, the unit of exposure is the coulomb per kilogram (C/kg) of air. One roentgen is equal to 2.58E-4 coulomb per kilogram of air.

**1-015.02** As used in 180 NAC, the units of dose are:

1. Gray (Gy) is the SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (100 rad).
2. Rad is the special unit of absorbed dose. One rad is equal to an absorbed dose of 100 erg per gram or 0.01 joule per kilogram (0.01 Gy).
3. Rem is the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor (1 rem = 0.01 Sv).
4. Sievert is the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sievert is equal to the absorbed dose in gray multiplied by the quality factor (1 Sv = 100 rem).

**1-015.03** As used in Title 180, the quality factors for converting absorbed dose to dose equivalent are shown in Table I.

TABLE IQUALITY FACTORS AND ABSORBED DOSE EQUIVALENCIES

TYPE OF RADIATION	Quality Factor (Q)	Absorbed Dose Equal to a Unit Dose Equivalent <sup>a</sup>
X, gamma, or beta radiation and high-energy electrons	1	1
Alpha particles, multiple-charged particles, fission fragments and heavy particles of unknown charge	20	0.05
Neutrons of unknown energy	10	0.1
High-energy protons	10	0.1

<sup>a</sup>Absorbed dose in gray equal to 1 Sv or the absorbed dose in rad equal to 1 rem.

1-015.04 If it is more convenient to measure the neutron fluence rate than to determine the neutron dose equivalent rate in rems per hour or sieverts per hour, as provided in 001.15C, 0.01 Sv (1 rem) of neutron radiation of unknown energies may, for purposes of these regulations, be assumed to result from a total fluence of 25 million neutrons per square centimeter incident upon the body. If sufficient information exists to estimate the approximate energy distribution of the neutrons, the licensee or registrant may use the fluence rate per unit dose equivalent or the appropriate Q value from Table II to convert a measured tissue dose in gray or rad to dose equivalent in sievert or rem.